

CLAIMS

1. An apparatus for producing a trip signal to activate a circuit breaker in an  
5 alternating current power line, said apparatus comprising:  
    a sensing circuit operable to sense values representing:  
        a phase difference between current and voltage in said power line; and  
        a current amplitude in said power line;  
    a comparison circuit operable to compare said sensed values of phase  
10 difference and current amplitude with a trip characteristic defining fault conditions  
and non-fault conditions and to generate a fault indication signal when a fault  
condition arises;  
    a fault discriminator operable in response to said fault indication signal to  
generate a fault identifying signal discriminating between:  
15 a first class of fault in which a mean current value after said fault indication  
increases relative to a mean current value before said fault indication; and  
    a second class of fault in which a mean current value after said fault  
indication does not increase relative to a mean current value before said fault  
indication; and  
20 a trip signal generator responsive to said fault identifying signal and operable  
to generate said trip signal.
2. The apparatus according to claim 1, wherein said alternating current power  
line carries a three phase alternating current power supply.
- 25 3. The apparatus according to claim 1 or 2, wherein said trip signal generator  
generates a trip signal when said fault identifying signal identifies that said fault  
indication is due to said first class of fault occurring.
- 30 4. The apparatus according to claim 1, 2 or 3, wherein said first class of fault is a  
short circuit.
5. The apparatus according to claims 2 and 4, wherein said short circuit is a  
phase-to-phase short circuit.

6. The apparatus according to claim 1 or 2, wherein, when said fault identifying signal identifies that said fault condition is due to said second class of fault occurring, said trip signal generator generates a trip signal if said fault discriminator determines  
5 that said fault condition has persisted for longer than a predetermined time.

7. The apparatus according to claim 1 or 2, wherein, when said fault identifying signal identifies that said fault condition is due to said second class of fault occurring, said fault discriminator generates a state indication signal discriminating between a  
10 second class of fault caused by:

a first state in which there is loss of current for a period following said fault indication followed by restoration of current to a level corresponding to the current level before said fault indication; and

a second state in which there is loss of current for a period following said fault  
15 indication followed by a current at a level lower than the current level before said fault indication.

8. The apparatus according to claim 7, wherein said first state is due to switchgear series arcing.  
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9. The apparatus according to claim 7, wherein said trip signal generator generates a trip signal when said state indication signal identifies that said fault indication is due to said second state occurring.

10. The apparatus according to claim 9, wherein said second condition is an increase in the resistance of a circuit comprising said power line.  
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11. The apparatus according to claim 10, wherein said second condition is series arcing due to a defective connection.  
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12. A method for producing a trip signal to activate a circuit breaker in an alternating current power line, said method comprising the steps of:

sensing values representing:

a phase difference between current and voltage in said power line; and

- a current amplitude in said power line;
- comparing said sensed values of phase difference and current amplitude with a trip characteristic defining fault conditions and non-fault conditions;
- generating a fault indication signal when a fault condition arises;
- 5 discriminating, in response to said fault indication signal, between:
  - a first class of fault in which a mean current value after said fault indication increases relative to a mean current value before said fault indication; and
  - a second class of fault in which a mean current value after said fault indication does not increase relative to a mean current value before said fault
- 10 indication;
  - generating a fault identifying signal in response to said discriminating; and
  - generating a trip signal in response to said fault identifying signal.